Re:

Diane Nacci to: Nathan Schumaker 12/05/2012 01:35 PM
Cc: David Olszyk, Sandy Raimondo

Excellent - thanks much for pulling this all together.

Nathan Schumaker Hi Diane and Sandy Below, I've collected all of t... 12/05/2012 02:50:02 PM

From: Nathan Schumaker/COR/USEPA/US
To: Diane Nacci/NAR/USEPA/US@EPA, Sandy Raimondo/GB/USEPA/US@EPA
Cc: David Olszyk/COR/USEPA/US@EPA, Nathan Schumaker/COR/USEPA/US@EPA
Date: 12/05/2012 02:50 PM
Subject:

Hi Diane and Sandy
Below, I've collected all of the material I've sent your way over the past few days. I've also attached (PPT and PDF) a draft slide that I think might match what you expressed interest in yesterday. Let me know if this seems like a valuable graphic, and if you have thoughts on improvements, etc. Hopefully, by collecting all of this into one email, it makes your job a tiny bit easier ;)
Nathan

---------- ORIGINAL FUNDING REQUEST ----------

FY13 Funding Request

Project: CSS 2.4.1, Subtask 7 (HexSim)

Amount Requested: $100K (minimum) - $200K (optimal) to support HexSim model development in FY13. These funds would be used to pay for software development (computer programming) being performed through an existing on-site technical support contract with CSC.

Background: HexSim is a computer model being developed at the EPA. It has been designed to assist the agency in evaluating the impacts of pesticide use on threatened and endangered plant and animal populations. EPA is legally obligated to perform such analyses, but has thus far only developed methodology to evaluate pesticide impacts on individual organisms. Evaluating the impacts of pesticides on populations is much more complex because populations are exposed to multiple interacting stressors that are highly variable across time and space. There is extensive legal precedent indicating that, to be defensible, endangered species recovery planning must make use of the best available scientific methodology. HexSim fits this legal definition, and therefore its continued development and use will help the EPA to defend the science behind its pesticide regulation decision making when those decisions impact species of conservation concern.

Progress Thus Far: Over the past few years, HexSim has evolved rapidly, and has become recognized as one of the foremost tools available for forecasting the impacts of human activities on species of concern. HexSim is also being increasingly used in the development of mitigation and recovery planning. For example, HexSim is currently being used by the US Fish and Wildlife Service in their ongoing recovery planning for the northern spotted owl. HexSim is also being used by multiple federal and state agencies, universities, and NGOs nationally, and has a strong international presence (e.g. the model is in use at the Australian equivalent to the US Fish and Wildlife service, for the purpose of developing

recovery strategies for multiple endangered populations). HexSim formed the basis of two large funding awards made to the University of Washington by the DOD / SERDP. The first of these was made in cooperation with EPA, and helped to support the initial model development. Our notoriety and exposure, including these funding awards, reflect the fact that HexSim is the only tool that can couple detailed map-based information about human and natural disturbance with ecologically realistic models of plants and animals. And HexSim can be used with a wide range of species, landscapes, and disturbance regimes, meaning that scientists and stakeholders need only master one software application to address a wide range of management concerns.

Critical Ongoing Work: Support is required to improve the HexSim model in four focal areas. (1) Ease of Use. A few specific parts of the HexSim model interface are inconvenient to use and require modification. Updating these features within the HexSim user-interface will make it easier for agency scientists and stakeholders to run the model. (2) Aquatic Species. We are now developing new tools within HexSim that will make it possible to model aquatic species living in river networks, such as endangered salmon. This work will greatly increase HexSim's utility for EPA, and it will help us contribute to a wide array of ongoing research on aquatic species being conducted within ORD. Once these features are in-place, HexSim will also be the only model in its class that can simulate interactions between terrestrial and aquatic ecosystems. (3) Plants. We are now adding mechanisms to HexSim that will improve the model's ability to simulate plant life histories. This will allow us to better study pesticide impacts on endangered plants, including plant / animal interactions. This enhancement fills a significant unmet need within our agency. (4) Genetics. HexSim has recently been labeled the first "next generation population viability analysis (PVA) tool", because it is the only model that can create a biologically-realistic coupling between traditional demographic analysis and population genetics. PVA tools have traditionally ignored genetic concerns such as inbreeding and outbreeding, and this is now recognized as an critical shortcoming even in regards to forecasting the short-term impacts of management activities. We are presently in the process of enhancing the usability of HexSim's genetics toolkit to improve its value for EPA, and for stakeholders.

Consequences of No Funding: Our work in the four focal areas listed above cannot proceed without funding because we do not have any staff within the federal workforce who are capable of modifying the HexSim user interface. This expertise exists within our on-site CSC contract, and this contract has been the vehicle though which the entire HexSim model interface has been constructed. Thus, we will be unable to deliver usable tools that meet EPA's needs without this funding. Specifically, without support for FY13, we will not be able to fully integrate aquatic species or plants into the model. These taxa represent a large segment of the species of conservation concern over which EPA (for reasons involving pesticide regulation) is in close consultation with the federal courts (as a result of ongoing lawsuits). Without this support, we will also not be able to make the critical model interface changes that have been identified, through multiple recent outreach sessions and workshops, as critical usability issues for the HexSim.

---------- RELEVANT ACTIVITIES ----------

1. I'm heavily involved with the University of Washington in a EPA-funded research study examining pesticide impacts on the endangered San Joaquin kit fox. This is a modeling study built upon HexSim. It will provide a real-world illustration of how HexSim can be used to look at the impacts of multiple interacting stressors on a population of concern, when one of the stressors is a regulated pesticide. This is mostly an "off-target" impact, as the pesticides in question are used to control agricultural pests -- mostly rodents.
2. I hosted a visit here at WED of a member of the EFED team -- Tanya Crk. We have developed a plan to use HexSim to generate scaling rules that EFED could use to extrapolate pesticide impacts from

individuals to populations. EFED does frequently perform this sort of extrapolation, but at present does so using some very rough scaling constants that I gather are not really possible to justify ecologically. This represents an ideal initial product for OCSPP since it would be a refinement of a method already in use.

3. David Olszyk and I are planning a workshop with OCSPP / EFED later this year to bring everyone up to speed on research being done on wildlife impacts of pesticides, to talk about extending the modeling work to plants and fish, and other topics. This meeting is still in the planning stages, but tentatively set for DC in July.

4. I have been working extremely long hours over the past two years to improve HexSim's ability to model stressor impacts on a wide range of wildlife species. HexSim can simulate a wide range of stressors, but pesticide impacts have always been a central focus of this work. We are not yet done, as you know, but we do have the best platform for conducting this sort of analysis that has ever been developed. There are a wide range of potential applications for EPA, and if we can continue the work for a little longer, we will be able to add fish and plants to the spectrum of life histories that HexSim is adept at modeling. Given the difficulty, amount of effort required, and cost of such a project, it is extremely unlikely that other researchers or software developers will construct an alternative to HexSim. some traction with them, but its slow.

5. Some recent events attest to the national and International recognition that the HexSim effort is garnering. I have begun giving HexSim workshops at the national meetings of scientific societies. I organized a 1/2 day symposium entirely devoted to HexSim at ESA this year. There were 11 talks on HexSim at that meeting. I have taken trips to Australia (twice) and New Zealand recently to speak about HexSim. I get inquiries about the model daily or weekly, from a national and international audience. The US Fish and Wildlife service has based its recovery planning for the northern spotted owl on a series of HexSim simulations, etc. But still, HexSim has been designed principally to meet OCSPP / EFED's needs. EPA is a bit of a late-adopter of the technology, but it holds great promise for the agency. This will be especially true if we can obtain the additional support requested.

---------- FUNDING CLARIFICATIONS ----------

When I made my initial appeal for FY13 funds, my characterization of the HexSim project was very honest. Specifically, I indicated that I would be able to deliver some products without funding, just not the full range of products, or quality of products that would be possible with funding. It has since become very evident that we really do need additional funding in order to deliver the quality of products that OCSPP deserves. I described these enhanced / additional products in my last message. It is true that work on these improvements will stop without additional funding. It is also true that I can still develop some products for EPA with HexSim as it exists today. But EPA will get a significantly better set of products if a small amount of additional funding can be obtained. Given how few ORD research efforts actually produce usable tools for our clients, it seems we should be given some priority access to funding. ORD's clients want tools, but usually they just get scientific papers!

My request for funding is indeed for one to two programmers. Each programmer costs roughly 150K / year. This is a very hard number to pin down, and it includes massive overhead that is built into the contract. I am sharing contractor time with another researcher in an effort to keep the key contract staff on-board. If we lose that expertise, it will not be possible to re-acquire it. It would take years (and of course huge amounts of money with little resultant output) to get new people up to speed. And that assumes the contractor would recruit people who have the requisite skills, which is a huge practical constraint. $100K in new funding would allow me to retain one key contractor, and to have access to roughly 2/3 of his time. $200K in new funding would allow me to retain both contractors currently contributing HexSim. $200K would not be enough to keep both contractors working on HexSim full time. The other PI here who is contributing funds for contract software development is also struggling to get FY13 support. We don't know at this time how much he will have to contribute, but it may be as little as $50K.

With $100K I could get much or all of my items 1 (Ease of Use), 3 (plants), and 4 (genetics) finished. I would need the additional $100K to get item 2 (fish) to the point that it could be used by other researchers and managers, including EPA clients.

So $100K = about 2/3 of a programmer. I need at least 2/3 contract FTE to address the current model shortcomings other than fish. I would need another 2/3 - 1.0 contract FTE to really get fish done nicely.[attachment "HexSim Slide.pdf" deleted by Diane Nacci/NAR/USEPA/US] [attachment "HexSim Slide.pptx" deleted by Diane Nacci/NAR/USEPA/US]